What Neuroscience Can Tell Us About Virtual, Augmented and Mixed Reality

I am not a Neurologist.

Not Even Close.

I am not a Brain Expert.

Not Exactly.

1/12/16

Started VR Practice inside Isobar US

VR’s impact on the brain

To create believable, usable and meaningful virtual experiences, we have to take into account the way the mind understands the human condition.

Presence

Investigating body ownership, virtual presence, socialization, communication, ”uncanny valley” effects and other results of adopting and participating in virtual presence, beyond ages of classical physiological armchair experiments.

Perception

We have been accustomed to the physics and expected interactions between humans and our environment. Being able to intercept these signals and disrupt expected behavior and response could have profound effects.

NeuroHaptics

Our brains are prediction machines and we must try to understand how to create perceptual illusions and learning mechanisms that play to this.

2/21/17

stroke

Brain Damage



“VR experiences have become something like virtual or artificial versions of themselves. Everything is scrambled”

- Me *(March-June, 2017)*

VR’s impact on the brain

To create believable, usable and meaningful virtual experiences, we have to take into account the way the mind understands the human condition.

Presence

Investigating body ownership, virtual presence, socialization, communication, ”uncanny valley” effects and other results of adopting and participating in virtual presence, beyond ages of classical physiological armchair experiments.

Perception

We have been accustomed to the physics and expected interactions between humans and our environment. Being able to intercept these signals and disrupt expected behavior and response could have profound effects.

NeuroHaptics

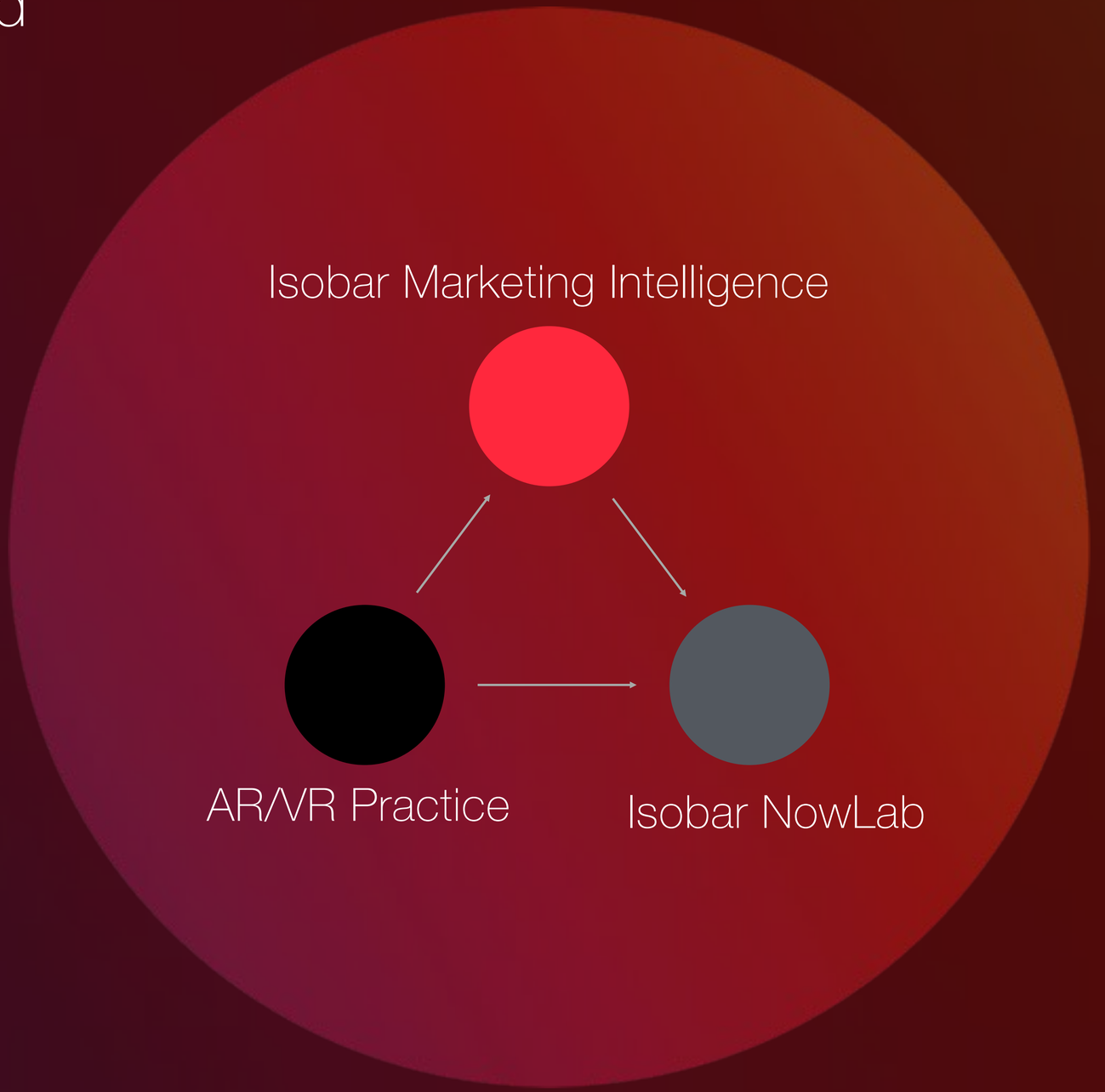
Our brains are prediction machines and we must try to understand how to create perceptual illusions and learning mechanisms that play to this.



I Got Geeky on the EEG

In order to get myself back to being myself, I dove into trying to understand biometrics, particularly brain waves / EEG and start to research the relationship between data and perception. It was time to try and quantify things.

Intersections Lead to Innovations



Intersections Lead to Innovations

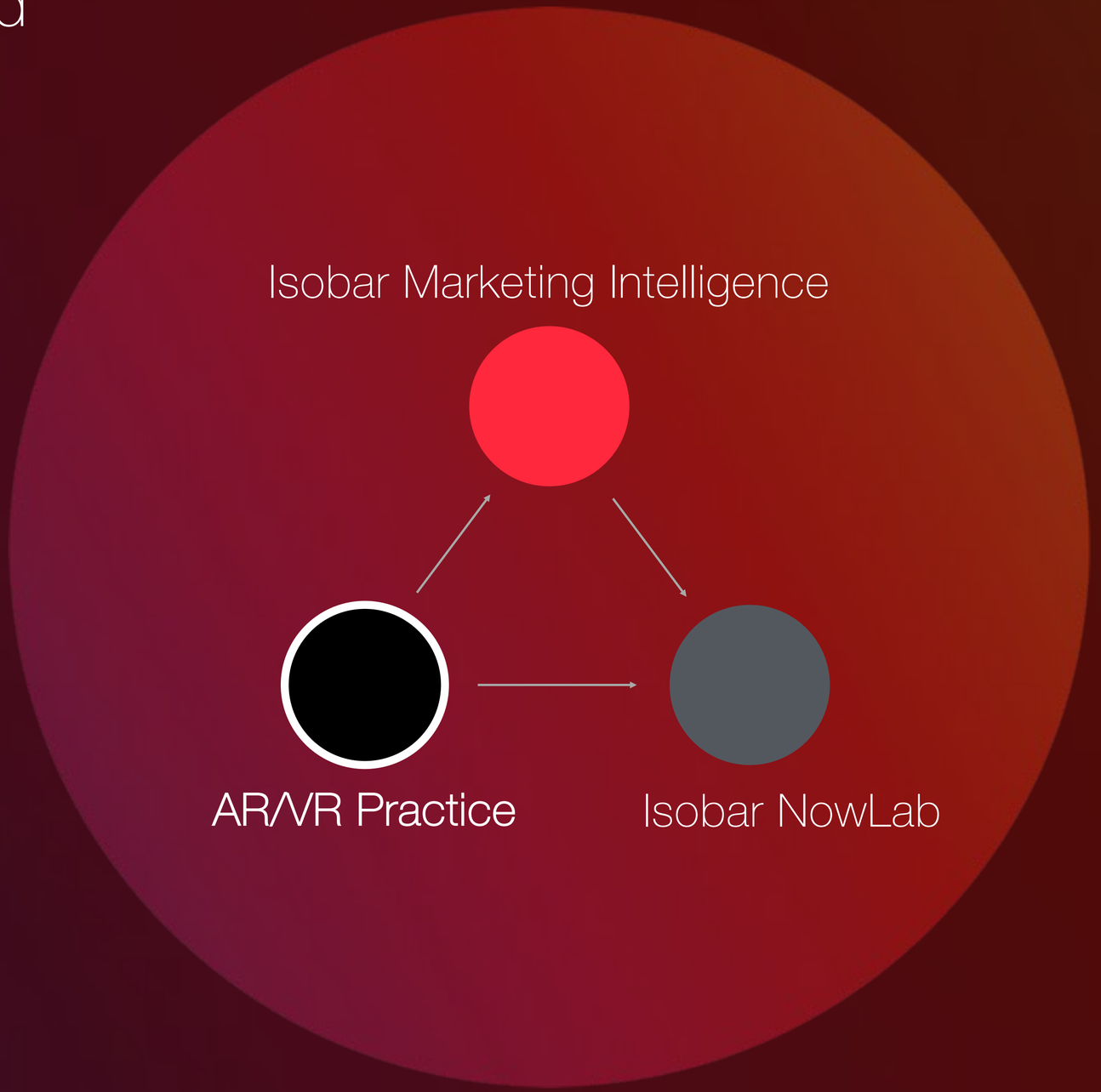
Isobar Marketing Intelligence focuses on research, insights and produces incredible results in terms of user profiling, segmentation and insights on how content impacts consumers from an emotional perspective.



Intersections Lead to Innovations

Our AR/VR practice has a very skilled team that ranges from 3D artists to game developers as well as all of the other tech and design muscle that Isobar brings to the table.

We've been building experiences for GM, The Air Force, Wyndham Resorts and others, like Billy Corgan of the Smashing Pumpkins.



Intersections Lead to Innovations

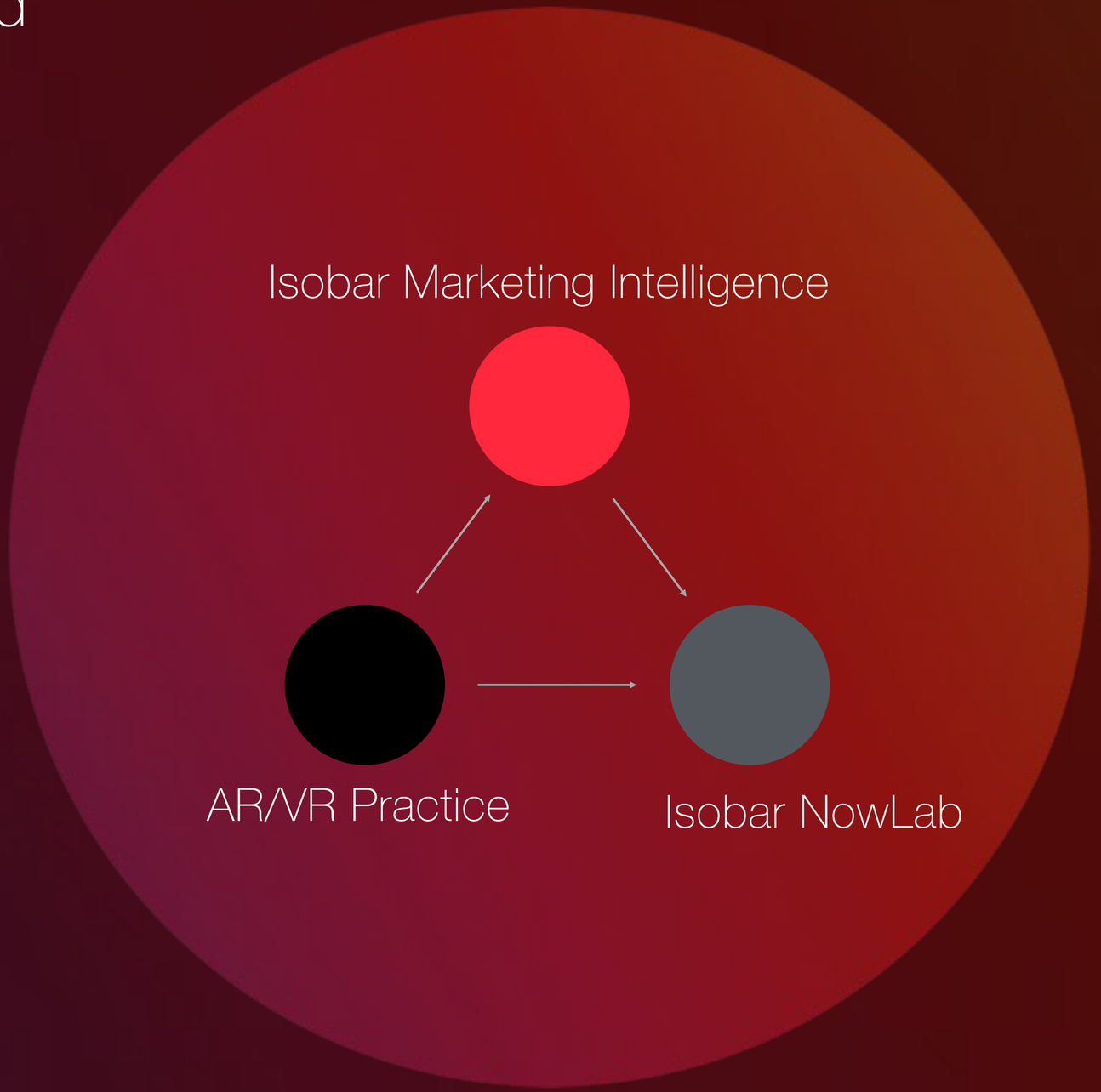
The Isobar NowLab is our R&D playground that focuses on the Isobar Innovation Protocol and works to understand emerging technologies and concepts and get our staff up to speed on what is coming next.



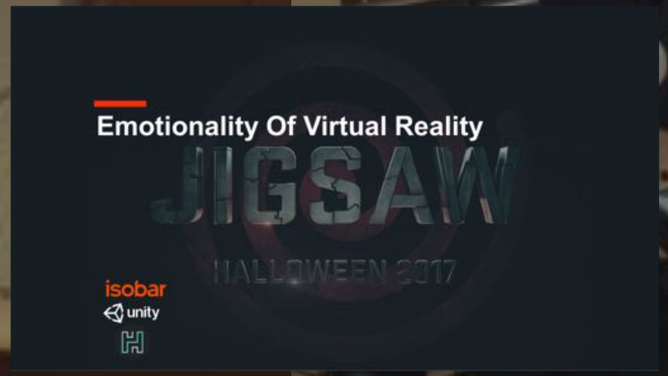
Intersections Lead to Innovations

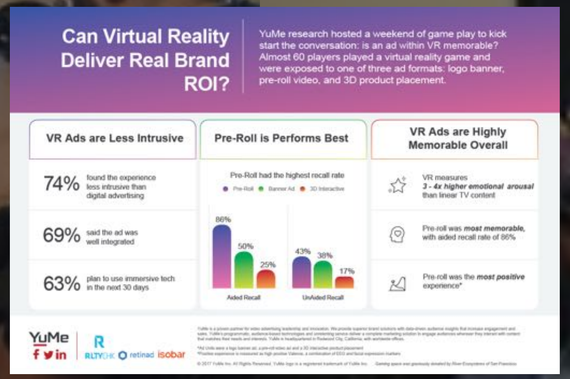
Through collaborating and sharing resources and expertise we were able to work together to create a full behavior and biometric analysis platform.

This is geared towards better understanding human perception and emotion.



Isobar NeuroLab Up & Running…





PRESS: ADWEEK VentureBeat ADVANCED TELEVISION Business Wire MARTECH TODAY MediaPost

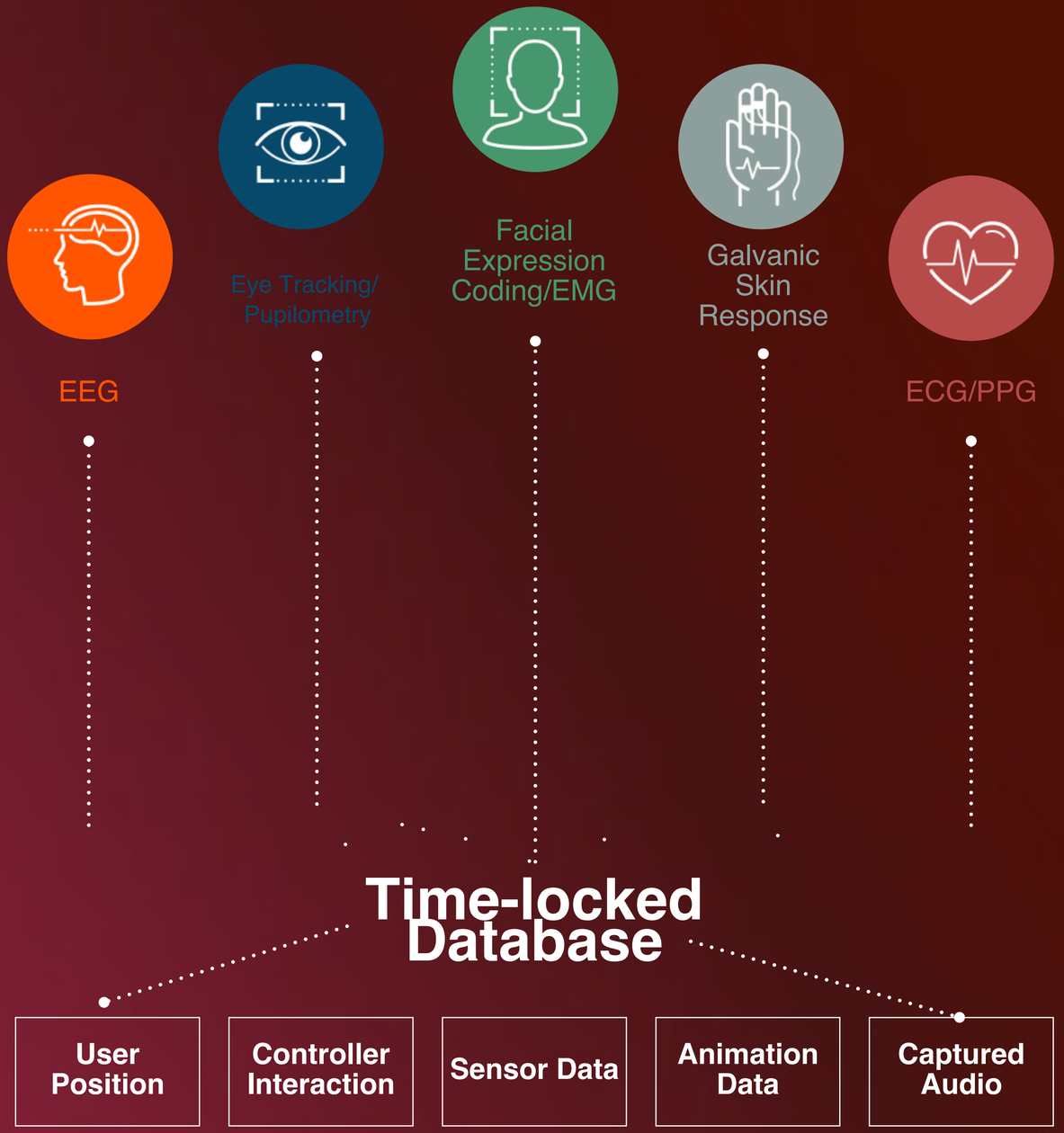
Using Neuroscience & Biometrics to Understand Emotion

Consumer Research

Using biometrics to understand how people react to messages, images, video or other standard content.

AR/VR Measurement

Frame-by-frame capture of user perspective and behavior combined with biometric data.



Reading into things







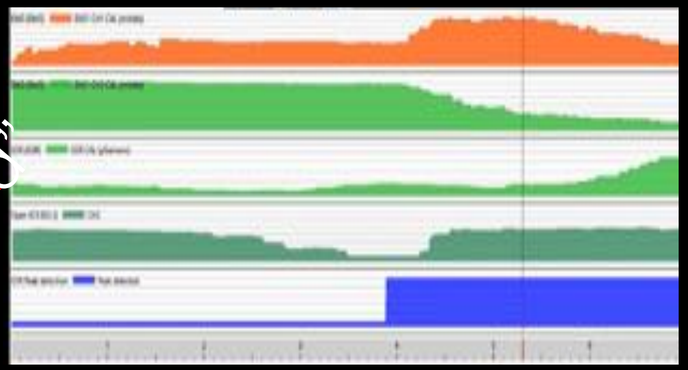


	POSITION & MOTION Use of physical space, direction & time spent in area	EYE TRACKING	EMOTIONAL AROUSAL	EMOTIONAL VALENCE
WHAT WE MEASURE				
HOW WE MEASURE IT	Using X, Y, Z coordinates of hand controllers and goggles tied to skeletal physiology to impute a full body avatar of the user	Measuring visual attention using infrared eye tracker for flat-screen and mobile devices, and custom eye tracker for VR	Measuring skin conductance and heart rate variability as indicators of autonomic physiological arousal	Measuring EEG asymmetry and facial muscle contractions (EMG) as indicators of pleasant vs. unpleasant affect
WHY WE MEASURE IT	Insight into where users go and don't go, and into features that users struggle with (& why)	Insight into the elements of the experience that draw attention and those that are overlooked	Insight into the features of the experience that are emotionally arousing, or not	Insight into the features of the experience that elicit positive or negative feelings

PATTERN MATCHING OF EMOTIONAL STATE



"Stressed"



"Excited"

f-EMG Zyg

f-EMG Cor

GSR

EEG

Peak detect





"Bored"

"Relaxed"



isobar

Outcome

AR/VR (Mixed Reality) has current challenges for adoption, enough compelling content being one of the primary reasons.

AR is much more accessible today given advances on mobile.

HMDs are still a barrier for many consumers, but when experiencing ”good” AR or VR there is a profound and powerful reaction.

The VR Content Problem

VR Revolutionizes How We Tell Stories

CONTEXTUAL



Put a consumer in an environment

EMPATHETIC



See through the eyes of another person, shared experiences

IMAGINATIVE



Interact with and make new things

With Different Levels of Immersion

PASSIVE

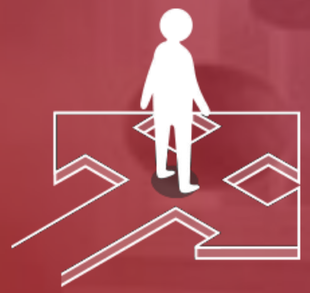


The user is taken on a journey

Linear experience

Utilize 360° views

MODERATE



Sleek mobile integration

The consumer controls aspects of the experience
User can explore environments

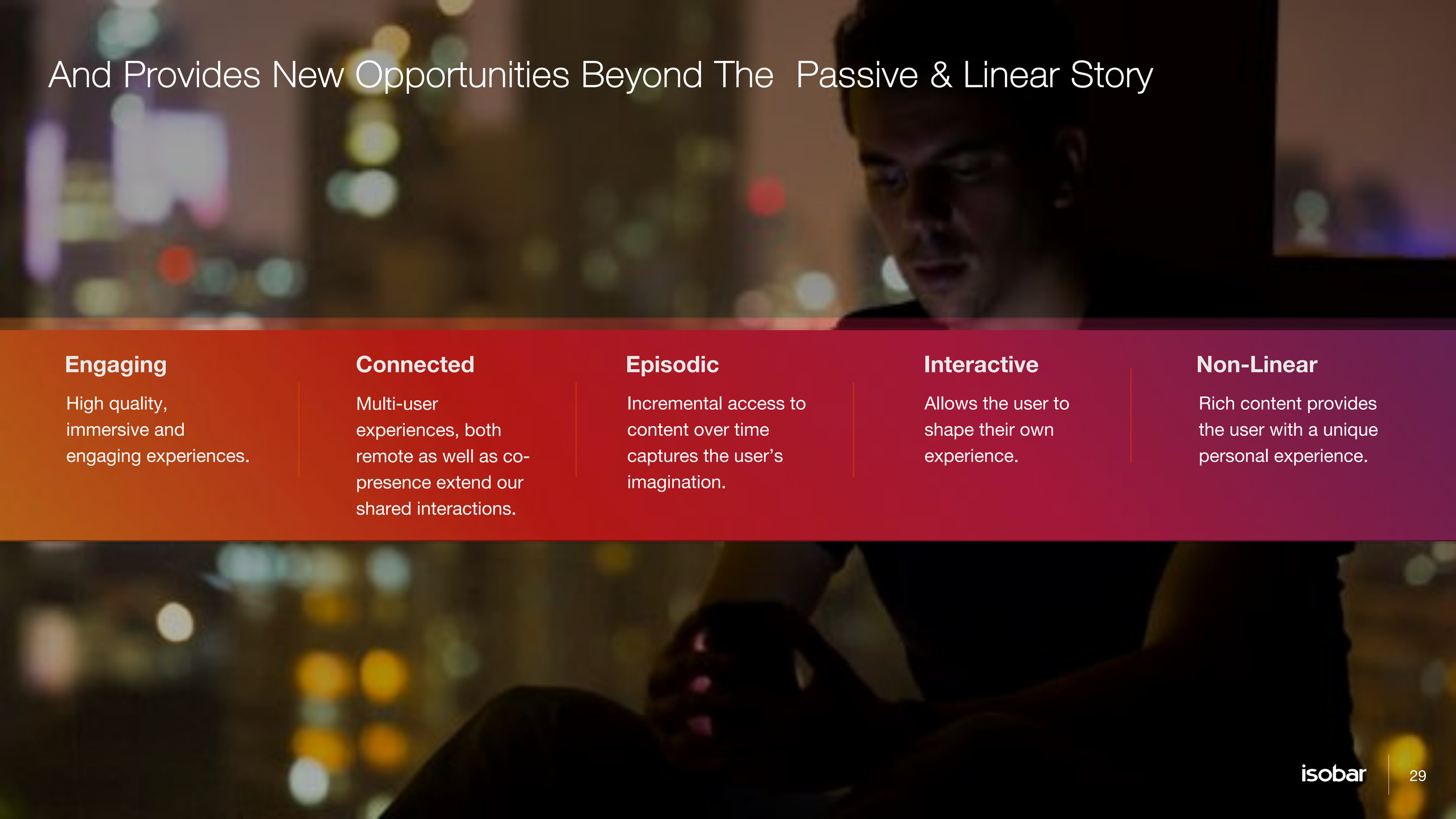
IMMERSIVE



Fully immersive environments

Live-rendered interactive environments
The user is in full control

And Provides New Opportunities Beyond The Passive & Linear Story



Engaging

High quality, immersive and engaging experiences.

Connected

Multi-user experiences, both remote as well as co-presence extend our shared interactions.

Episodic

Incremental access to content over time captures the user's imagination.

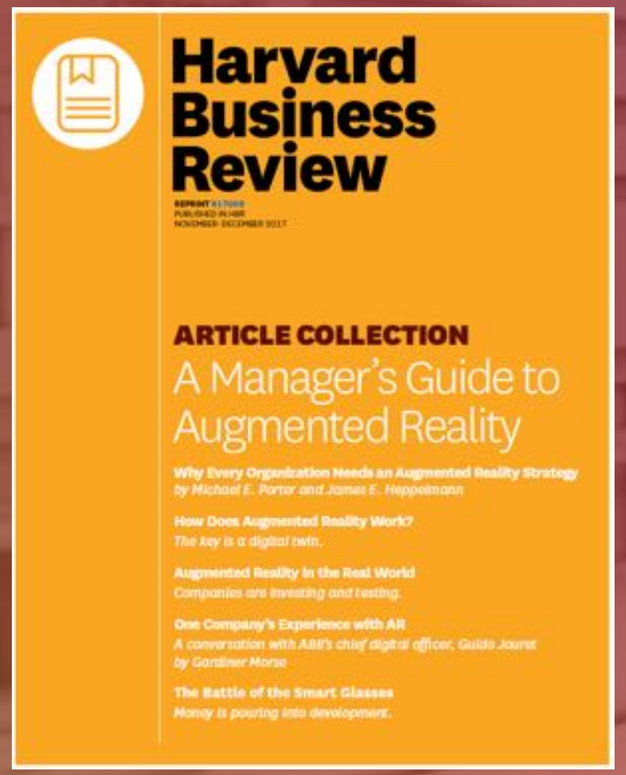
Interactive

Allows the user to shape their own experience.

Non-Linear

Rich content provides the user with a unique personal experience.

Good AR/VR Design Needs UX/UI Testing



4. Should the company make AR design and deployment a core strength, or will outsourcing or partnering be sufficient?

Many firms are scrambling to access the digital talent needed for AR development, which is in short supply. One skill in great demand is user experience or user interface (UX/UI) design. It's critical to present 3-D digital information in ways that make it easy to absorb and act on; companies want to avoid making a stunning but unhelpful AR experience that defeats its core purpose. Effective AR experiences also require the right content, so people who know how to create and manage it—another novel skill—are crucial too. Digital modeling capabilities and knowledge of how to apply them in AR applications are key as well.

Over time we expect companies to create teams dedicated to AR, just as they set up such teams to build and run websites in the 1990s and 2000s. Dedicated teams will be needed to establish the infrastructure that will allow this new medium to flourish and to develop and maintain the AR content. Many firms have started to build AR skills in-house, but few have mastered them yet.

Great Content Can Be Quantified

TRADITIONAL MOVIE TRAILER

IMMERSIVE VR EXPERIENCE

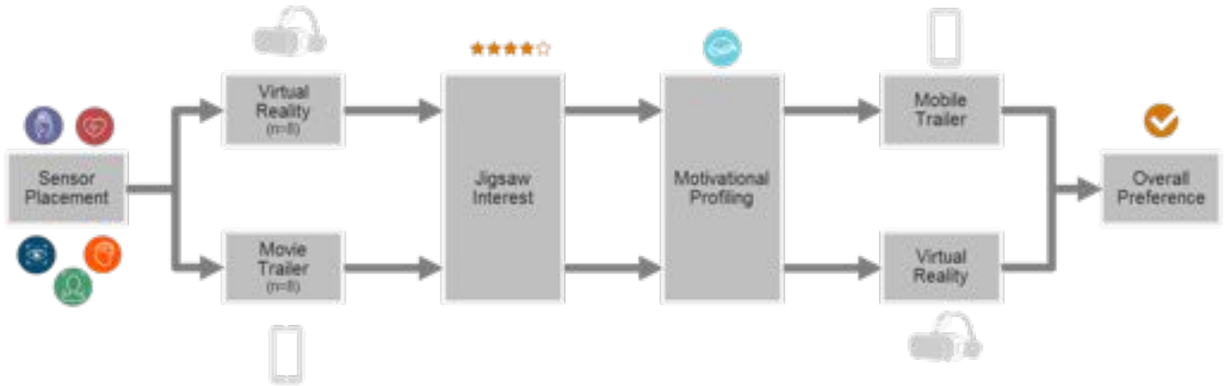


Unity teamed up with Isobar's Marketing Intelligence Practice to see just how scary Jigsaw Virtual Room really was to users. Isobar performed biometric measurement and an emotional response survey of people who experienced the movie trailer in VR and in mobile video.


FULCRUM
ISSUE ONE



Evaluating Immersive VR as an advertising medium for Lionsgate Jigsaw



	Heart Rate (beats/min)*	89.8 ✓	88.4	72.5	24%	VR experience and the trailer portion of the VR generated increased heart rate (emotional arousal) compared to the movie trailer.
	Heart Rate Variability (St Deviation)	7.2 ✓	5.8	5.0	44%	The VR experience and trailer induced larger variation in heart rate and indicates a greater range in emotional arousal.
	GSR CAL (µSiemens)*	9.0 ✓	7.1	6.2	45%	Increase galvanic skin conductance in the VR experience and trailer versus the movie trailer also indicate greater emotional arousal.
	EMG ZYG (mVolts)	15.7 ✓	14.6	3.6	336%	Greater activation of the zygomatic muscle indicates stronger emotional valence (smiling).
	EEG Asymmetry (St Deviation)	.52 ✓	.28	.26	100%	Larger variability in frontal asymmetry for the VR experience suggests it triggered larger swings in emotional valence (approach vs withdrawal).

Final Thought: Permanency of Uniqueness

L'ARRIVÉE D'UN TRAIN EN GARE DE LA CIOTA
(THE ARRIVAL OF A TRAIN AT LA CIOTAT STATION)
DIRECTED AND PRODUCED BY AUGUSTE AND LOUIS LUMIÈRE
- PRESENTED IN JANUARY 1896 -



Q&A

@dmeeker